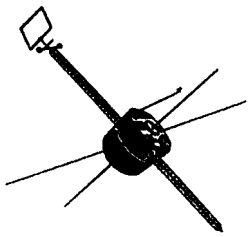
DE 1
Dynamics Explorer 1

Spacecraft Sketch	Mission Objective
	The Dynamics Explorer (DE 1&2) mission is designed to supply specific knowledge concerning the coupling of energy, electric currents and fields, and plasmas between the magnetosphere, the ionosphere and the atmosphere. The DE 1&2 spacecraft are launched into coplanar polar orbits (e.g., same plane, but different altitudes). This orbital configuration provides for data acquisition at two altitudes within common magnetic flux tubes, thus fulfilling the requirement for simultaneous data sets in the magnetosphere and in the ionosphere/atmosphere. While each DE spacecraft contributes to science through its individual complement of experiments, the mission success is primarily dependent on the combined, correlative measurements of the two sets of spacecraft experiments. A central project-funded data processing and analysis system provides users with geophysically meaningful data from all instruments.

TYPE OF MISSION	PROGRAM OFFICE	PROJECT LEAD CENTER	MANAGEMENT APPROACH	S/C CONTRACTOR	I&T CONTRACTOR
SPACE PHYSICS	SPACE SCIENCE	GSFC	HYBRID	RCA	RCA

Payload Description

The Dynamics Explorer (DE 1) high-altitude mission payload consists of two field, one optical emissions, and three charged particle instruments. The DE 1 is one of two spacecraft that is launched by the same vehicle into a polar coplanar orbit, thus permitting simultaneous measurements at high and low altitudes in the same field-line region. The DE 1 spacecraft is spin stabilized and approximates a short polygon, with antennas mounted in both the x-y plane and the z-axis, and a solar array mounted on the spacecraft side and end panels. A pulse code modulation (PCM) telemetry data system operates in either real time or a tape recorder mode. The data is acquired from the instruments and temporarily stored on tape recorders for later transmission. Commands are stored in a command memory unit. This allows non-real-time spacecraft operation except for the transmission of analog data from one instrument.

INSTRUMENT NAME	ACRONYM	PI AFFILIATION	PRINCIPAL INVESTIGATOR	I&T CONTRACTOR
ENERGETIC ION COMPOSITION SPECTROMETER	EICS	LPAL	E. G. SHELLEY	GSFC
HIGH ALTITUDE PLASMA INSTRUMENT	HAPI	SWRI	J. L. BURCH	SWRI
MAGNETIC FIELD OBSERVATIONS	MAG-A	GSFC	M. SUGIURA	GSFC
PLASMA WAVE INSTRUMENT	PWI	UNIV IOWA	S. D. SHAWHAN	UNIV IOWA
RETARDING ION MASS SPECTROMETER	RIMS	MSFC	C. R. CHAPPELL	MSFC
SPIN-SCAN AURORAL IMAGER	SAI	UNIV IOWA	L. A. FRANK	UNIV IOWA

Instrument Descriptions
The DE 1 Energetic Ion Composition Spectrometer (EICS) experiment consists of a curved-plate electrostatic energy analyzer followed by a combined cylindrical electrostatic-magnetic mass analyzer utilizing electron multipliers as detectors. The energy analyzer is operated in two basic energy ranges: low and high. In the high-energy range the plate potentials are programmable in 32 steps such that the external energy per unit charge is measured in the range between 0.10 and 17 keV with nearly equal logarithmic steps. At the lowest step, the analyzer becomes transparent to all ions with energy less than about 150 eV. Open multipliers are used with pulse amplitude discrimination for the mass analyzer detectors to improve the mass separation characteristics of the spectrometers.
The DE 1 High Altitude Plasma Instrument (HAPI), Data Point 528, is designed and built by Southwest Research Institute (SWRI) to measure the phase-space distributions of electrons and positive ions. The instrument has five detector heads mounted on the detector body: three are mounted on the spin plane and the other two are offset by plus and minus twelve degrees. Each detector head consists of an electrostatic analyzer of the ISIS 2 type and one electron sensor and one ion sensor. Energy range is 5 eV to 25 KeV.
The DE 1 Magnetic Field Observations (MAG-A) instrument is a three-axis fluxgate magnetometer with digital compensation of the ambient field in precise 8000 gamma increments. Track and hold modules are used to obtain simultaneous samples on all three axes. A precision filter external to the fluxgate loop is provided to define the instrument bandwidth and transient response. The accuracy of the measurement depends on instrumental error sources, thermal control of the sensor, boom stability, and deployment accuracy.
The DE 1 Plasma Wave Instrument (PWI), Data Point 531, is designed and built by the University of Iowa to measure the intensity and spectra of electromagnetic and electrostatic waves associated with the auroral, plasmaspheric and other magnetospheric plasma processes. The instrument uses two long dipole antennas, a single axis search coil, a magnetic loop antenna, and a short electric antenna to cover the 1 Hz to 2 Mhz frequency range.
The DE 1 Retarding Ion Mass Spectrometer (RIMS) utilizes a retarding potential analyzer for energy analysis, in series with a magnetic ion mass spectrometer for mass analysis. The instrument consists of a detector head mounted radially to the spin axis, so that the detector sweeps out an arc nearly in the magnetic meridian plane. In the apogee or retarding potential analyzer mode, the thermal particle fluxes are measured as the potential on the set of retarding grids is stepped through a sequence of settings. In the perigee or sweep mode, the retarding grids are grounded and the detection utilizes a continuous acceleration potential sweep that focuses the mass ranges on the low, mid and high mass sensors.
The DE 1 Spin-Scan Auroral Imager (SAI), Data Point 529, is designed and built by the University of Iowa to provide global auroral imaging at visible and ultraviolet wavelengths. The instrument consists of three individual photometers. Two photometers image in the 3914-6300 angstrom region using a small photomultiplier tube with an extended red photocathode. The third photometer images in the 1216-1700 angstrom range using a Spin-Scan Newtonian telescope and a photomultiplier tube with a Csl photocathode and a MgF2 window.

Launch
08/03/81(1) 08/03/81(2)